2018 ASPIRE WHITE PAPER SUBMISSION

CONTACT INFORMATION

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WILLING TO ATTEND WORKSHOP?

Yes

TARGET NAME

Northern margin of the Little Bahama Bank: deep coral reefs and canyons.

GEOGRAPHIC AREA(S) OF INTEREST WITHIN THE NORTH ATLANTIC OCEAN

(Indicate all that apply)

☐Northwest ☐North Central ☐Northeast
☐Southwest ☐South Central X Southeast

RELEVANT SUBJECT AREA(S) (Indicate all that apply)

X Biology X Geology ☐Chemistry
X Physical Oceanography ☐Marine Archaeology ☐Other

DESCRIPTION OF TOPIC OR REGION RECOMMENDED FOR EXPLORATION

Over the past several decades, a large amount of information has been generated on the deep slopes of the southeastern US continental margin from the Carolinas to Florida. These studies described vast deep-water coral habitats that support diverse and abundant sessile fauna and their associates, including fisheries species such as golden crab, royal red shrimp, deep water groupers. Adjacent areas in Bahamian waters are understudied by comparison, but recent mapping efforts in the region have revealed large areas of potential deep sea coral mounds, canyons and other complex topography. The few areas of the deep Bahamian slope that have been explored, show different temperature-depth profiles and species assemblages from those reported in the continental US. The dominant oceanographic feature in this region is the Gulf Stream, which flows northwards between the western (continental US) and eastern (insular Bahamas) sides of the Florida Straits. The Gulf Stream waters create a sufficiently continuous environment from their origin in tropical latitudes, to sub-tropical latitudes further north, that many benthic and demersal organisms have ranges extending from northern South America to the southeastern US. The Gulf Stream flow could serve as a conduit for population connectivity among deep sea communities and fishery resources in the US and Bahamas. Alternatively, this powerful current could create a biogeographic barrier between communities on either side of the axis.

The proposed exploration region encompasses three general areas (described below) of the northern Little Bahama Bank (LBB), and addresses the ASPIRE program goals to 'explore and characterize physical, geological and biological features and processes across the North Atlantic, including international waters'. The primary physical feature in the proposed region is the Gulf Stream, which influences geomorphology, species distributions and population connectivity within the region and beyond. The proposal encompasses ecologically and economically valuable benthic habitats, many of which are unexplored, in a region of future energy development and

potentially expanding fisheries activity. The information collected will help understand links between US and Bahamian deep sea communities and optimally will lead to combined efforts at management and conservation of shared natural resources.

1)*Western LBB*. Distributional ranges of many deep-water benthic and demersal taxa extend north along the continental US side of the Florida Straits, often reaching biogeographic barriers at the Carolinas; whereas many on the eastern Bahamas side occur no further north than the western corner of the LBB (e.g. 21 Scleractinia, 11 Octocorallia, ~35 Decapoda, 13 Crinoidea, ~50 Asteroidea, and 5-10 fishes). This region may therefore represent the northern extent of deep-water tropical western Atlantic fauna, but species descriptions have been limited to scattered trawl and dredge surveys. Recent detailed mapping of a portion of this area has revealed major topographic features, including an escarpment in 275-460 m surrounding an ancient slump feature, an isolated 50 m tall pinnacle, and a field of smaller pinnacles, which may be coral mounds in 450-570 m. The biological communities associated with this unusual topography have not been investigated and this area coincides with the northern limit of many tropical deep-water taxa, making it an excellent candidate for exploration and investigations into biogeographic boundaries.

2) *Mullins' Reefs.* Mullins *et al.* (1981, 1984) reported an area of features described as coral mounds (1000-1300 m) patchily distributed across an area of at least 2,500 km² on the northern slope of LBB. These features are > 60 km east of the well-documented mounds of the western Blake Plateau in US waters, which support a diverse fauna of corals, sponges, octocorals, antipatharians, hydroids, and other invertebrates and fishes. Dredge samples of the Mullins reef area included eleven genera of scleractinian corals. The majority were solitary, but the branching coral *Solenosmilia variabilis* and the solitary *Bathypsammia* sp. were the dominant stony corals, whereas *L. pertusa* absent, probably due to the depth of the mounds. Much of the northern LBB slope was recently mapped, including the area of Mullins' *Solenosmilia* mounds. These maps show a complex area of shallow canyons and furrows, with a significant escarpment separating this zone from a flatter area to the north. Small dots scattered through the area might represent Mullins coral mounds. The combination of a possibly unique (to the western Atlantic) *Solenosmilia*-dominated reefs and the other complex seafloor structures make this area a fascinating target for exploration

3) *Great Abaco Canyon.* Canyon geomorphology causes currents to be funneled along the axis at sufficient speed to remove sediment and expose hard substrates. These are colonized by sessile benthic fauna (such as corals and sponges) that are not found on the sedimentary slopes, therefore canyon biodiversity is generally higher than surrounding slope areas. Numerous canyons dissect the outer margin of the US continental shelf from North Carolina northward. However, over 800 km separates the southernmost of these from three canyons on the Blake Escarpment north of the Bahamas. The geology of the largest, Great Abaco Canyon, was studied in 1975 and 1977, and one ROV dive in nearby Little Abaco Canyon documented the presence of deep corals and higher fish diversity than continental canyons further north. We propose to explore Great Abaco Canyon and collect baseline data on benthic faunal composition, zonation, and distributional limits, for comparison with continental canyons to the north and deep island margin faunas to the south.

RELEVANT PARTNERSHIPS

Dr. C. Messing, NOVA Southeastern University, Mr. J. Reed, Harbor Branch Oceanographic Institute, Cape Eleuthera Institute, Smithsonian Museum of Natural History, others TBD.